Lernende Systeme

GERMANY'S PLATFORM FOR ARTIFICIAL INTELLIGENCE

APPLICATION SCENARIOS FOR AI

Swift assistance during rescue missions

Starting point

Disasters and accidents – such as major fires, chemical spills, earthquakes, nuclear power plant failures and terrorist attacks – cause severe damage and expose the emergency response teams at the scene to risks. Teams need to find and injured victims as quickly as possible, prevent damage from spreading any further and stabilise the situation. In their work, they often have to rely on standardised guidelines, incomplete information and their own personal experience. Time pressure and stress serve to exacerbate the situation.

In just a matter of years, self-learning systems will be able to provide rescue workers with effective support during operations in hostile-to-life environments. Whether remote-controlled or autonomous, these systems can undertake a whole range of tasks – from risk prevention and defence measures to repairing damage and providing emergency aid.

Application scenario

A major fire has broken out at a chemical plant. When the plant fire brigade arrives at the scene, it's almost impossible to assess the situation. Is there a danger that parts of the building could cave in? Is there a gas leak that could cause an explosion? Is anyone injured? In this precarious situation, the firefighters receive support from self-learning robots that take charge of different tasks, carrying them out exactly as needed during the different stages of the rescue operation.

Surveying the situation

Unmanned aerial and ground vehicles (UAVs/UGVs) help to conduct a detailed reconnaissance of the situation and pinpoint critical areas and victims as quickly as possible. Equipped with a variety of intelligent sensors, they can prevent collisions, identify hazardous substances, and monitor the physical condition of rescue workers and potential victims. These autonomous robots can be integrated into rescue operations to provide first aid or evacuate material and can request further assistance, all the while analysing their own condition.

Communication and cooperation

During the operation, these intelligent robots communicate both amongst themselves – to prevent collisions, for instance – and with the firefighters. They provide everyone involved with real-time updates on the situation to

ensure the rescue mission goes quickly and efficiently, relaying information to the specialists in the control centre, who can get right to the heart of the action using immersive technologies if required. Spoken commands, gestures and biosignals, meanwhile, enable human-machine interaction with the victims and rescue workers on the ground.

Learning for the future
Each disaster is unique and presents humans and robots with fresh challenges. The intelligent robots involved record a range of data during their deployment to equip them for future tasks, scouring existing online data for efficient behavioural patterns in new situations. This enables these systems to use their own experience and that of others to learn how to optimise their skills. As their mission draws to a close, the robotic assistants collect equipment, objects and other immobile systems and return to the set target position.

Benefits

Self-learning robots and assistance systems can adapt to changed situations without needing to be programmed in advance. They fundamentally improve the working methods of emergency service teams, particularly in dangerous situations of a chaotic or dynamic nature.

- **Efficiency:** Victims can be rescued faster and damage to property limited.
- **Safety and protection:** Rescue workers are exposed to less danger and supported in physically strenuous situations.
- **Extra aid:** At certain accident sites, intelligent assistance systems are the only way to conduct a rescue operation.
- **Durability:** Efficient learning procedures enable autonomous robots to make the right decisions based on scarce data.

Challenges

The following issues need to be clarified before humans and robots can work hand in hand in rescue operations:

- **Privacy:** How is personal data treated?
- **Decisions:** How do robots react to dilemmas, for example, when rescuing injured victims?
- **Liability:** Who is liable for any damage caused by self-learning robots?
- **Security:** How can they be effectively protected against abuse?

What needs to be done?

The following steps are necessary if this application scenario is to become a reality within a few years:

- Conduct further research and development work to design marketable systems
- Establish simulation and (immersive) test environments where autonomous robots and rescue workers cooperate
- Provide targeted funding to fully harness the high economic potential of self-learning systems for use in hostile-to-life environments, including in international markets
- Devise uniform standards and independent certification

The "Swift assistance during rescue missions" application scenario was developed by the Hostile-to-Life Environments Working Group of Plattform Lernende Systeme.
Learn more about this topic at www.plattform-lernende-systeme.de

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